

Teacher Notes



Revenue, Costs, and Maximizing Profit

Activity 2 Investigating Maximizing Profits

Activity at a Glance

- ◆ **Subject:** Social Studies
- ◆ **Subject Area:** Economics
- ◆ **Category:** Microeconomics
- ◆ **Topic:** Prices
- ◆ **Grade Level:** 9 - 12
- ◆ **Prerequisites:** Students should be familiar with revenues and costs and various measurements such as Total Revenue, Marginal Revenue, Average Cost and Marginal Costs.
- ◆ **Total Teaching Time:** 45 minutes

Materials

- ◆ TI-83 Plus or TI-83 Plus Silver Edition
- ◆ CellSheet™ Application
- ◆ Student Work Sheet: **Investigating Maximizing Profits**

Activity Overview

In this activity, students calculate measurements related to revenue and cost and then calculate profit. By examining profit, students investigate the measurements that give information about what production quantity gives the company maximum profit. The whole class then discusses and shares their conclusions.

Tip

It is important that the entire class have an opportunity to discuss their findings and avoid any misunderstandings.

Directions

Before the Activity Begins

Make sure each student has a TI-83 Plus loaded with the CellSheet™ Application. Make copies of the Student Work Sheet, **Investigating Maximizing Profit**, so that each pair of students has a copy.

Warm-up Activity

The students should already have a background on revenue and costs and related measurements. A review of these concepts may be worthwhile depending on the class.

The teacher should lead a brief discussion on profit and why companies would want to produce at levels that maximize profit.

During the Activity

Have the students work with their partner from Activity 1 so that one student is more familiar with Revenue and the other student is more familiar with Cost. Distribute a copy of the Student Work Sheet to each pair of students. Monitor student progress to ensure that students are completing their work. It may be necessary to provide additional structure for this activity.

After the Activity

Lead a class discussion that includes the questions from the worksheet. Summarize with the class the key ideas of when profit is at a maximum and what measurements give us that information.

If time permits, students can explore “what if” scenarios with the data and the CellSheet™ file they created for this activity. For example, students may wish to examine various scenarios for revenue and cost to confirm their findings that profit is maximized when marginal revenue equals marginal cost.

It may be beneficial to invite a speaker from the local chamber of commerce or Rotary club to speak to students about the running of a small business and the challenge of balancing marginal revenue and costs in order to maximize profits.

Selected Possible Answers – Investigating Maximizing Profits

2. The profit curve goes below the axis. The costs become greater than revenue.
3. Cost also influences profit, not just revenue.
4. Revenue also influences profit, not just cost.
5. The marginal cost and revenue are equal.
6. Since marginal revenue is the addition to revenue by increasing output by one and marginal cost is the additional cost of increasing output by one, when MR is greater than MC, by producing one more item the firm will increase their profit. If MR is less than MC it will reduce its profit. The optimal point occurs when the two are equal.

Student Work Sheet

Name: _____

Investigating Maximizing Profits

Date: _____

In this activity you will be investigating the revenue and cost schedules for a company to determine the level of production that is required to maximize profits.

You will work with another student to analyze the data provided and set up calculations and graphs in a CellSheet™ file.

The following is data for a company:

Price	Quantity Demanded/Supplied	Total Cost
20	0	3.00
18	1	6.00
16	2	10.00
14	3	14.50
12	4	20.00
10	5	26.00
8	6	32.50
6	7	40.00
4	8	48.00
2	9	57.00

Using the CellSheet™ application:

Examine the revenue and costs of production and calculate various measures of revenue and cost using the CellSheet™ application on the TI-83 Plus device.

- A. To enter data, first press **[APPS]** and then select the CellSheet™ application by moving the cursor beside it and pressing **[ENTER]**.

Follow the directions on the screen (press any key). You may wish to make note of the Help Menu that appears (also shown at the right). Press any key to continue.



B. A spreadsheet appears., do the following:

- ◆ Press **GRAPH** (the key under the word **Menu**).

```
CELLSHEET MENU
1:File...
2:Edit...
3:Options...
4:Charts...
5:Help
6:Quit CellSheet
```

- ◆ Select **1:File** by pressing **1** or highlighting the 1 and pressing **ENTER**.

```
SAVE AS...
Old:S01
New:
Enter
```

- ◆ If the spreadsheet that appeared was blank, select **2:Save As** and enter the file name. Use the title **PROFIT**.

REVE	A	B	C
1			
2			
3			
4			
5			
6			
A1:			[Menu]

- ◆ If a previously loaded spreadsheet was displayed, select **3:New** and enter the file name. Use the title **PROFIT**.

```
NEW...
Old:S01
New:
Enter
```

- C. Move your cursor to cell A1 and enter the heading for the column. To enter text you need to enter " first (above the + key). Since you will be entering a large amount of text, it may be helpful to turn on the alpha-lock by pressing **2nd** **[ALPHA]**. Enter the title: **PRICE**. In the following cells, enter these headings:
- B1: QD (quantity demanded)
 - C1: TR (total revenue)
 - D1: MR (marginal revenue)
 - E1: QS (quantity supplied)
 - F1: TC (total cost)
 - G1: MC (marginal cost)
 - H1: AC (average cost)
 - I1: Profit
- D. Enter the values provided on the first page of this work sheet under the appropriate columns. For example, enter Price in column A, cells A2 to A11; Quantity Demanded in column B; Quantity Supplied in column E; and Total Cost in column F.
- E. Complete the other columns other than column for Profit by using the appropriate formulas. To enter a formula, move the cursor to the cell, press **[STO▶]** and then enter the formula using the cell references. For example Total Revenue would be in cell C2 and the formula is $A2*B2$. To copy the formula to the rest of the cells in the column, press **[ZOOM]**, then **[Y=]** and move the cursor to highlight the cells. Press **[TRACE]** to complete the process. Note: The first cell under Average Cost will be an ERROR due to division by 0. Ignore this value.
- F. To calculate the Profit, the formula is Total Revenue – Total Cost. Enter the formula in cells I2 to I11.

- G. Construct a Line graph of the Profit. To construct a Line graph, press **GRAPH** to access the **MENU**. Select **4:Charts** and then **3:Line**.

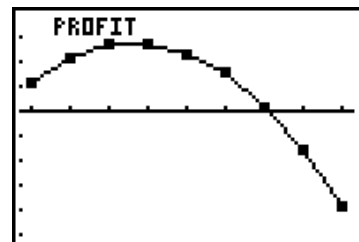
```
CELLSHEET MENU
1:File...
2:Edit...
3:Options...
4:Charts...
5:Help
6:Quit CellSheet
```

```
CHARTS
1:Scatter...
2:Scatter Window
3:Line...
4:Line Window...
5:Bar...
6:Bar Window...
7:Pie...
```

Enter cells **E3:E11** for the XRange (this is the quantity). (Exclude the case of 0.) For YRange1, enter **I3:I11**. Enter an appropriate title such as **PROFIT**.

```
LINE CHART
XRange:E3:E11
YRange1:I3:I11
YRange2:
YRange3:
Title:PROFIT
AxesOn AxesOff
DrawFit Draw
```

Move the cursor to DrawFit and press **ENTER** to see the Line graph. Press **TRACE** to identify key values using the arrow keys.



1. Sketch a copy of the graph and indicate the location where profit would be maximized. Note the quantity that should be produced to maximize profit and what the profit at this point would be.

2. Note on the graph the point at which the company loses money. How do you know from the graph? Return to the CellSheet™ application by pressing **2nd****MODE**. Find the row where the company begins to lose money. What is happening in terms of revenue and costs at that point?

3. Find the row where the profit is at a maximum. Examine the total revenue column. Note that the quantity to produce the maximum profit is not the same quantity to produce the maximum revenue. Explain what factor influences the profit that revenue alone does not take into account.

4. We will again look at the row where the profit is at a maximum. Examine the average cost column. Note that the quantity to produce the maximum profit is not the same as the quantity to produce the lowest average or unit cost. Explain what factor influences the profit that cost alone does not take into account.

- H. Construct Line graphs of the Profit, Marginal Revenue and Marginal Cost. To construct a Line graph, press **GRAPH** to access the **MENU**. Select **4:Charts** and then **3:Line**. Cells **E3:E11** should be entered for the XRange. Leave the YRange1 as **I3:I11** (Profit). Enter **D3:D11** (Marginal Revenue) for YRange2 and **G3:G11** (Marginal Cost) for YRange3. Enter an appropriate title such as **PROFIT MR MC**. Move the cursor to DrawFit and press **ENTER** to see the Line graphs.

```

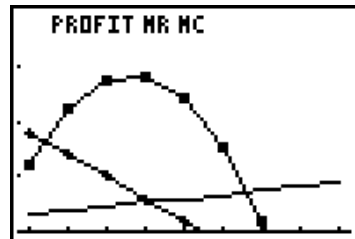
LINE CHART
XRange:E3:E11
YRange1:I3:I11
YRange2:D3:D11
YRange3:G3:G11
Title:PROFIT MR...
AxesOff
DrawFit Draw
    
```

To see the graphs a bit better, adjust the values displayed by pressing **WINDOW**. Change the Ymin value to 0 since you will not need to see when profit is below 0.

```

LINE WINDOW
Xmin=.68
Xmax=9.32
Xscl=1
Ymin=0
Ymax=39.39
Yscl=10
Draw Save
    
```

Move the cursor down to **Draw**, and press **ENTER**. Press **TRACE** to identify key values using the arrow keys.



5. What do you notice occurs with the Marginal Revenue and Marginal Cost lines at the quantity where the maximum Profit occurs?

6. Explain why it would make sense that maximum Profit occurs when Marginal Revenue equals Marginal Cost. Consider the following:
- ◆ what is meant by Marginal Revenue and Marginal Costs?
 - ◆ what happens to profit when Marginal Revenue is greater than Marginal Cost?
 - ◆ what happens to Profit when Marginal Revenue is less than Marginal Cost?